



NASA STTR 2011 Phase I Solicitation

T10.01 Test Area Technologies

Lead Center: SSC

Innovative Component Technologies

The focus of this topic is the development of innovative rocket test facility components (e.g., valves, flowmeters, actuators, tanks, etc.) for ultra high pressure (>8000 psi), high flow rate (>100 lbm/sec), and cryogenic environments. Robust and reliable component designs which are oxygen compatible and can operate efficiently in high vibro-acoustic, transient environments are being sought. Components which can also provide coupled high-speed (kHz-MHz) measurement and control of rocket propellant feed systems with minimum induced system losses are desirable. Proposals of innovative valve design concepts which will provide true linear performance for installed configurations and/or provide dynamically adjustable valve trimming are encouraged. Expected TRL at end of Phase I is 2, and at the end of Phase II is 4.

Advanced Rocket Facility Environment and Health Monitoring

Development of practical, industrial-grade, advanced flow/thermal diagnostics and smart sensors to monitor the near field environment (thermal, acoustic, emission) that a rocket test facility is exposed to during an engine/stage testing is requested. Examples of advanced rocket test environment diagnostics would include high-speed robust scanning or visualization of rocket exhaust plumes for simultaneous heat flux, species/temperature and/or near-field acoustics. In addition to the rocket test induced environments, infrastructure health monitoring and management for test facilities and for widely distributed support systems (WDSS) such as gas distribution and cooling water is needed. Capabilities being sought for WDSS include remote monitoring of vacuum lines, gas leaks, and fire, where the use of wireless technologies in order to eliminate running miles of power and data wires would be beneficial in this application. The proposed innovative systems must lead to improved safety and reduced test costs by allowing real-time analysis of data, information, and knowledge through efficient interfaces to enable integrated awareness of the system condition by users. Need for improved technologies are mid-term, and highly desirable. Expected TRL at end of Phase I is 3, and at the end of Phase II is 6.

Development of New Materials for Rocket Plume Deflection

Refractory materials are commonly used to provide thermal protection of rocket plume deflectors on test facilities and launch pads. Advancement of refractory materials or development of new materials for the requirement of minimizing erosion (1500 BTU/ft²/sec) and shear/normal loads caused by the direct impingement of rocket exhausts is desired. Unlike launch facilities, test facilities are exposed to the plume environments for long durations (on the order of minutes) making the material requirements for minimum erosion even more stringent. The newly proposed material would need to be competitive to the material, installation and repair costs of current commercial grade high-temperature refractory materials. Also, the material development proposal should demonstrate the

performance of the material in dynamically similar environments as would be present on the rocket test stand. Expected TRL at end of Phase I is 2, and at the end of Phase II is 4.

Technologies for Propellant Conservation

The objective is to minimize usage of costly gases (helium and hydrogen) through devices that can recover/recycle efflux from cryogenic test facilities (currently no recovery is done). This could include technologies such as real time gas sampling/contamination monitoring system for propellant and purge systems that could also help minimize use of non renewable resources such as Helium, or Helium reclamation carts for recapture of inert/purges. Expected TRL at end of Phase I is 3, and at the end of Phase II is 6.